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Atmospheric Measurement Techniques Discussions

Interactive comment on "Novel aerosol extinction coefficients and lidar ratios over the ocean from CALIPSO-CloudSat: Evaluation and global statistics" *by* David Painemal et al.

Anonymous Referee #1

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The paper is well written. It contains original and interesting results, a nice technique is used by combing spaceborne lidar (CALIOP) and radar (CloudSat) observations. All this is highly appropriate to be published in AMT.

However, more comparisons with published (literature) observations of lidar ratios should be presented, and will improve the good paper.

My recommendation: Minor revisons.

Details:

P4, L10-12: Please be a bit more specific, more quantitative, if the extinction coefficient

is below 25 Mm-1 or the AOT is below 0.05 CALIOP will no detect this aerosol? Please, provide some kind of threshold numbers.

P6, L6-8: Is the two-layer method not similar to the approach of Ansmann, Appl. Opt, 45, 2006 (Ground-truth aerosol lidar observations: can the Klett solutions obtained from ground and space be equal for the same aerosol case?). Should probably be mentioned.

P6, L12-16: Regarding true marine lidar ratios, you may check and give reference to the papers of Gross et al., Tellus, 2011 (Cabo Verde, SAMUM2), ACP 2015 (Barbados, SALTRACE), Haarig et al., ACP, 2017 (SALTRACE, Barbados, wet and dry sea salt lidar ratios).

P7, L3: Great design of the campaign is visible in Fig.1! Well planned!

P7, L16: What is the truth? HSRL? How do you know, what the true AOD is?

P7, L27-29: column lidar ratio. . .. also given in Ansmann, Appl, Opt, 45, 2006.

P8, L1-8: Please explain better, first: 1L approach: all details, ... afterwards 2L approach, i.e., explain 1L and 2L separately, one after another. At the moment, too many details are given at the same time. . . , it took me some time to 'disentangle' the information properly.

P8, L14-19: Overestimation. . ., is that caused by the use of the Klett forward integration method? Could be mentioned. . .

P10, L18-21: Here, more comparisons with literature lidar ratio values would be good: Franke et al., GRL 2001, JGR 2003 (Indian Ocean, INDOEX, Maldives, Indian pollution aerosol, 2L structures. . .), Gross et al., , Tesche et al., both in Tellus 2011(eastern Atlantic, SAMUM2, Cabo Verde, summer and also winter, Tellus, 2011), Gross et al., 2015, Haarig et al. 2017, both in ACP (Caribbean, SALTRACE, Barbados, dust lidar ratios), Bohlmann et al, ACP, 2018, Polarstern cruises from the North to the South Atlantic, with Raman lidar aboard, also Kanitz et al., JGR 2013, issue 6. . And please

check also . . . all the papers from Japanese, Chinese, and Korean groups. A good starting point may be the following recent paper in ACP: Vertical variation of optical properties of mixed Asian dust/pollution plumes according to pathway of air mass transport over East Asia S.-K. Shin, D. Müller, C. Lee, K. H. Lee, D. Shin, Y. J. Kim, and Y. M. Noh Atmos. Chem. Phys., 15, 6707-6720, https://doi.org/10.5194/acp-15-6707-2015, 2015.

Please check the reference list in this paper for more lidar ratio papers.

P12, L10: limited number of observations of lidar ratios. . .. As mentioned please check the available literature. . ., and then 'update' this statement a little bit.

P12, L25 to P13, L30. . . and one has always to be careful with column lidar ratios, when marine particles are involved (so in the case of the SODA approach). The lidar ratio of sea salt is partly below 20sr, So these particles are rather efficient in backscattering of laser photons. As a consequence, their weight in the backscatter-weighted column integration. . . controls or can dominate the result. . .

Again, discuss the literature values (P13, L6, Kanitz, Bohlmann), L11-12, Franke et al., L15-16, Franke et al., L20-21, Haarig et al., Bohlmann et al.

All in all: An excellent paper!

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